

DEEP SPACE NETWORK REVITALIZATION - OPERATIONS FOR THE 21ST CENTURY

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Abstract

The National Aeronautics and Space Administration (NASA) supports unmanned space missions through a Deep Space Network (DSN) that is developed and operated by the Jet Propulsion Laboratory (JPL) and its subcontractors. The DSN capabilities have been incrementally upgraded since its establishment in the late '50s and are delivered from three Deep Space Communications Complexes (DSCC's) near Goldstone, California, Madrid, Spain, and Canberra, Australia. At present each DSCC includes large antennas with diameters from 11 meters to 70 meters, that operate largely in S-band and X-band frequencies. In addition each DSCC includes all the associated electronics to receive and process the low-level telemetry signals, and radiate the necessary command with high-power transmitters. To accommodate support of the rapidly increasing number of missions by NASA and other space agencies, and to facilitate maintaining and increasing the level of service in a shrinking budget environment, JPL has initiated a bold road map with three key components:

- 1. A Network Simplification Project (NSP) to upgrade aging electronics, replacing them with modern commercially based components. NSP and related replacement tasks are projected to reduce the cost of operating the DSN by 50% relative to the 1997 levels.*
- 2. Upgrade of all 34-m and 70-m antennas to provision of Ka-Band telemetry downlink capability, complemented by an existing X-band uplink capability. This will increase the effective telemetry downlink capacity by a factor of 4, without building any new antennas.*
- 3. Establishment of an optical communications network to support for high-data-rate unmanned missions that cannot be accommodated with radio-frequency (RF) communications, as well as establish a path toward support of manned missions at Mars.*

In this paper we present the mission loading projected for 1998-2008 and the elements of the JPL road map that will enable supporting it with a reduced budget. Particular emphasis will be on streamlining the architecture and to reduce the DSN cost for operations, maintenance and sustaining engineering while at the same time also simplifying and reducing the operations cost for the flight missions.

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